

Claims

1. A negative pressure booster which is operated in response to the introduction of atmosphere during an operation of an input member and generates an output from an output member, and transmits a reaction corresponding to the output from the output member to the input member by means of a reaction member, wherein

the negative pressure booster includes rapid output increase means which is operated when the input member is moved at a speed equal to or more than a predetermined speed set larger than a moving speed and with an input equal to or more than a predetermined value in a usual operation, and increases the output faster than the usual operation time, and

a start of the operation of the rapid output increase means is controlled using the reaction member.

2. A negative pressure booster at least comprising:
a valve body which is reciprocally arranged in the inside of a space formed by a shell, and hermetically and slidably penetrates the shell;

a power piston which is connected with the valve body and partitions the inside of the space into a constant pressure chamber into which a negative pressure is introduced and a variable pressure chamber into which atmosphere is introduced during an operation;

a valve plunger which is movably arranged on the valve body;

an input shaft which is connected with the valve plunger and is slidably arranged in the inside of the valve body;

an output shaft which is moved together with the valve body and generates an output due to an operation of the power piston;

a vacuum valve which is arranged in the inside of the valve body and is controlled by the advancing or the retracting of the valve plunger so as to establish the interruption or the communication between the constant pressure chamber and the variable pressure chamber;

an atmospheric valve which is arranged in the inside of the valve body and is controlled by the advancing or the retracting of the valve plunger so as to establish the communication or the interruption between the variable pressure chamber and the atmosphere; and

a reaction disc which transmits a reaction from the output shaft to the valve plunger, wherein

the negative pressure booster further includes rapid output increase means which is operated when the input shaft is moved at a speed equal to or more than a predetermined speed set larger than a moving speed in a usual operation and with an input equal to or more than a predetermined value, and increases the output rapidly as compared with the usual

operation time, and

a start of the operation of the rapid output increase means is controlled using a recess of the reaction disc which is formed by a pushing force from the valve plunger.

3. A negative pressure booster according to claim 2, wherein the predetermined value is constituted of a first threshold line which is set corresponding to the input when the input falls within a low input region and is changed linearly with a first predetermined inclination with respect to a change of the input and a second threshold line which is set corresponding to the input when the input falls within a high input region and is changed linearly with a second predetermined inclination different from the first predetermined inclination with respect to the change of the input.

4. A negative pressure booster according to claim 3, wherein a cylindrical holder is formed on the valve body in a state that the cylindrical holder brings at least a portion of a face thereof which faces the reaction disc into contact with the reaction disc,

the holder slidably holds a facing end portion of the valve plunger which faces the reaction disc and is capable of coming into contact with the reaction disc or a distance member which faces the reaction disc, is arranged to be capable of coming into contact with the reaction disc and adjusts a

distance between the valve plunger and the reaction disc, a recessed portion is formed in the facing face of the holder with the reaction disc, and when the input shaft is moved at a speed equal to or more than a predetermined speed set larger than a moving speed during the usual operation and the input is equal to or more than a value on the first threshold line and falls within the low input region, the reaction disc does not come into contact with the recessed portion, while when the input shaft is moved at a speed equal to or more than a predetermined speed set larger than a moving speed during the usual operation and the input falls within the high input region, the reaction disc comes into contact with the recessed portion.

5. A negative pressure booster according to claim 3, wherein a cylindrical holder is formed on the valve body in a state that the cylindrical holder brings at least a portion of a face thereof which faces the reaction disc into contact with the reaction disc, and a sleeve is slidably mounted in the inside of the cylindrical holder,

the sleeve slidably holds a facing end portion of the valve plunger which faces the reaction disc and is capable of coming into contact with the reaction disc or a distance member which faces the reaction disc, is arranged to be capable of coming into contact with the reaction disc and adjusts a distance between the valve plunger and the reaction disc,

one end of the sleeve is capable of coming into contact with the reaction disc and, at the same time, another end of the sleeve is capable of coming into contact with the valve plunger or the distance member, and

when the input shaft is moved at a speed equal to or more than a predetermined speed set larger than a moving speed during the usual operation and the input is equal to or more than a value on the first threshold line and falls within the low input region, the reaction disc does not come into contact with one end of the sleeve, while when the input shaft is moved at a speed equal to or more than a predetermined speed set larger than a moving speed during the usual operation and the input falls within the high input region, the reaction disc comes into contact with one end of the sleeve and another end of the sleeve comes into contact with the valve plunger or the distance member.